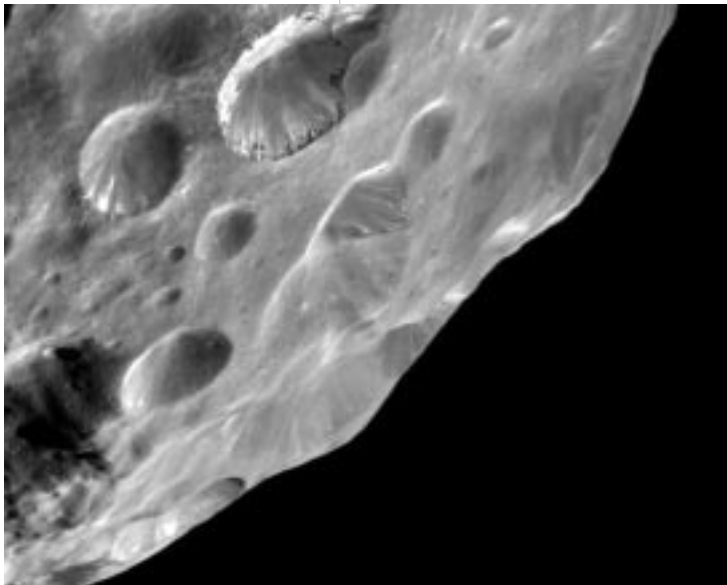


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Cassini passes Phoebe; Saturn next

By Carolina Martinez



This image of Phoebe was obtained on June 11 from a distance of 13,377 kilometers.

Images collected during Cassini’s close flyby of Saturn’s moon Phoebe have yielded strong evidence that the tiny object may contain ice-rich material, overlain with a thin layer of darker material perhaps 300 to 500 meters (980 to 1,600 feet) thick.

The surface of Phoebe is also heavily potholed with large and small craters. Images reveal bright streaks in the ramparts of the largest craters, bright rays that emanate from smaller craters and uninterrupted grooves across the face of the body.

“The imaging team is in hot debate at the moment on the interpretations of our findings,” said Dr. Carolyn Porco, Cassini imaging team leader at the Space Science Institute in Boulder, Colo. “Based on our images, some of us are leaning towards the view that has been promoted recently, that Phoebe is probably ice-rich and may be an object originating in the outer solar system, more related to comets and Kuiper Belt objects than to asteroids.”

Cassini came within approximately 2,068 kilometers (about 1,285 miles) of the dark moon on Friday, June 11. The spacecraft was pointing its instruments at the moon during the flyby. Several hours later it turned to point its antenna to Earth. The signal was received through the Deep Space Net-

work antennas in Madrid, Spain, and Goldstone, in California’s Mojave Desert, at 7:52 a.m. PDT June 12. Cassini was traveling at a relative speed of 20,900 kilometers per hour (13,000 mph) relative to Saturn.

“One down, 52 to go,” said Jeremy Jones, chief navigator for the Cassini-Huygens mission at JPL. During Cassini’s planned four-year tour it will orbit Saturn 76 times and execute 52 close encounters with seven of Saturn’s 31 known moons.

“Although this is the first flyby in the Saturn tour, it is the only opportunity to see Phoebe,” said Dr. Dennis Matson, project scientist for the Cassini-Huygens mission.

“This flyby is key to knowing more about the mysterious oddball, which has been the object of interest of many scientists.”

In ascertaining Phoebe’s origin, imaging scientists are noting important differences between the surface of Phoebe and that of rocky asteroids that

have been seen at comparable resolution. “Asteroids seen up close, like Ida, Mathilde and Eros, and the small martian satellites, do not have the bright ‘speckling’ associated with the small craters that are seen on Phoebe,” said Dr. Peter Thomas, an imaging team member from Cornell University.

The landforms observed in the highest-resolution images also contain clues to the internal structure of Phoebe. Dr. Alfred McEwen, an imaging team member from the University of Arizona, said, “Phoebe is a world of dramatic landforms, with craters everywhere, landslides and linear structures such as grooves, ridges and chains of pits. These are clues to the internal properties of Phoebe, which we’ll be looking at very closely in order to understand Phoebe’s origin and evolution.”

“I think these images are showing us an ancient remnant of the bodies that formed over 4 billion years ago in the outer reaches of the solar system,” said Dr. Torrence Johnson, an imaging team member from JPL. “Battered and beat-up as it is, it is still giving us clues to its origin and history.”

Dr. Gerhard Neukum, an imaging team member from Freie University in Berlin, said, “It is very interesting and quite clear that a lot of craters smaller than a kilometer are visible. This means, besides the big ones, lots of projectiles smaller than 100 meters (328 feet) have hit Phoebe. Whether these projectiles came from outside or within the Saturn system is debatable.”

Phoebe may be an icy interloper from the distant outer solar system that found itself captured by giant Saturn in its earliest, formative years. Final conclusions on Phoebe’s origins await a combination of the results on Phoebe’s surface structures, mass and composition gathered from all 11 instruments, which collected data during the flyby.

“This has been an impressive whirlwind flyby and it’s only a curtain raiser on the events about to begin,” Porco said.

Cassini arrives in orbit around Saturn on the evening of June 30 (July 1 Universal Time).

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. JPL manages the Cassini-Huygens mission for NASA’s Office of Space Science. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging team is based at the Space Science Institute, Boulder, Colo.

For the latest images and information about the mission, visit <http://saturn.jpl.nasa.gov> and the Cassini imaging team home page, <http://ciclops.org>.

Hills, crater beckon for rovers

By Guy Webster



JPL’s Mars rovers are delighting scientists with their extra credit assignments. Both rovers successfully completed their primary three-month missions in April.

The Spirit rover is exploring a range of martian hills that took two months to reach. It is finding curiously eroded rocks that may be new pieces to the puzzle of the region’s past.

Spirit’s twin, Opportunity, is also negotiating sloped ground. It is examining exposed rock layers inside a crater informally named “Endurance.”

“Both rovers have begun exploring brand-new places,” said Dr. Mark Adler, mission manager at JPL. “Opportunity has entered Endurance Crater. Spirit has arrived at the Columbia Hills. Both rovers are getting their second wind in bonus time, and we are very excited about the scientific potential we see at their new homes. Of course, the terrain at both locations is challenging, one up and one down. We are making certain that we proceed safely to keep these wonderful machines as healthy as we can for as long as we can.”

Spirit began climbing into Columbia Hills late last week, and right away sent pictures of tantalizing rocks. “Some of the rocks appear to be disintegrating. They have an odd kind of rotting appearance, with soft interiors and resistant rinds or hulls,” said Dr. Larry Soderblom, a rover science-team member from the U.S. Geological Survey, Flagstaff, Ariz. “The strangest things we’ve encountered are what we’re calling hooded cobras, which are evidently the resistant remnants of some of those rocky rinds. They stand above the surface like small canopies.”

Another rock, dubbed “Pot of Gold,” appears to have nodules and resistant planes in a softer matrix. Scientists have chosen it as a target for Spirit to examine with the instruments on the rover’s robotic arm. Afterwards, controllers plan to send Spirit to an outcrop farther uphill.

“Although it’s too early to even speculate as to the processes these rocks have recorded, we are tremendously excited over the new prospects,” Soderblom said.

The Columbia Hills rise approximately 90 meters (about 300 feet) above a plain Spirit crossed to reach them. Scientists anticipate a complex blend of rocks in the hills, perhaps holding evidence about a broader range of environmental conditions than has been seen in the volcanic rubble surfacing the plain. The entire area Spirit is exploring is within Gusev Crater. Orbital images suggest water may have once flowed into this Connecticut-sized basin.

Halfway around Mars, Opportunity has driven about 5 meters (16 feet) into stadium-sized Endurance Crater. “As we look back up toward the rim, we can see the progress we’ve made,” said Scott McLennan, science-team member from the State University of New York, Stony Brook.

Opportunity’s first target inside the crater is a flat-lying stone about 36 by 15 centimeters (14 by 6 inches) dubbed “Tennessee” for its shape. Opportunity will inspect it for analysis with the spectrometers and microscopic imager on the rover’s robotic arm. It is in a layer geologists believe corresponds to sulfate-rich rocks. The rocks are similar to those in which Opportunity previously found evidence for a body of water covering the ground long ago.

“The next step will be to move farther down from this layer to our first close-up look at a different sedimentary sequence,” McLennan said. “Color differences suggest at least three lower, older layers are exposed below Opportunity’s location.”

“The interpretation of those lower units is in a state of flux,” he said. “At first, we thought we would encounter poorly consolidated, sandy material. But as we get closer, we’re seeing more-consolidated, harder rock deeper into the crater. If we can get to the lower units, this will be the first detailed stratigraphic section ever done on another planet. We’re doing exactly what a field geologist would be doing.”

Spirit is showing what may be the first sign of age and wear. “The right front wheel is drawing about two to three times as much current as the other wheels, and that may be a symptom of degradation,” Adler said. “There may be steps we can take to improve it. We’ll be studying that possibility during the next few weeks.”

News Briefs



Jim Erickson



Dr. Firouz Naderi

From left: Robert Ryan, Joel Snyder, Dr. Arvydas Kliore, Larry Simmons, William Kirbofer, Paul A. Willis. Not pictured: Dr. John Anderson.

Erickson named MER manager

JAMES ERICKSON has been named project manager for the Mars Exploration Rover Project as his predecessor, RICHARD COOK, switches to the development of an even more capable Mars rover for launch in 2009.

Cook becomes deputy project manager for NASA's Mars Science Laboratory, the future rover mission whose project manager, PETER THEISINGER, managed the Mars Exploration Rover Project from its inception in mid-2000 until February 2004, when Cook succeeded him.

Both rovers remain healthy, though the harsh martian environment could end their operations at any point. "We are adapting to a pace of sustained exploration of the two landing sites," Erickson said. "The fun part of the job is working with the highest caliber engineers and scientists. The challenge is to lead without getting in their way."

Erickson was project manager for JPL's Galileo mission to Jupiter for three years prior to joining the rover project as mission manager in 2001. During 30 years at JPL, he has also worked on the Viking missions to Mars, the Voyager missions to the outer planets and the Mars Observer mission.

Cook was flight operations manager for the Mars Pathfinder project, which put a lander and small rover on Mars in 1997. He joined JPL in 1989 and worked on the Magellan mission to Venus prior to Pathfinder.

Naderi earns Italian honor

DR. FIROUZ NADERI, director of Solar System Exploration Programs and Mars Exploration Program manager, has been awarded the Liberal Prize by a leading Italian policy group.

Fondazione Liberal honored Naderi as "a personality whose work has contributed to profound changes in ideas in modern times." Naderi was recognized for his leadership role in the Mars Exploration Rover mission.

The award will be presented at an international conference on philosophical thought in Palermo, Sicily, in October. The prize consists of a plaque dedicated to Naderi's achievements and a \$3,000 honorarium.

"We believe that achievements such as the Mars missions are important positive symbols, reflecting a new, optimistic perspective that is more open to a hopeful future," the organization noted.

Pioneer 10 team receives honors

The Pioneer 10 Spacecraft Management Team at JPL recently received the Institute of Electrical and Electronics Engineers' Management Innovation Award for 2003.



The award was given on May 12 to DR. JOHN ANDERSON, WILLIAM KIRHOFFER, DR. ARVYDAS KLIORE and ROBERT RYAN. It was presented by IEEE's JOEL SNYDER and PAUL A. WILLIS "for innovative engineering management in coordinating diverse teams at multiple locations for complex astrophysical experiments in deep space."

CEC summer camp ready to open

Spaces are still available for the JPL/Caltech Child Educational Center's summer camp program. The camp for children completing kindergarten through 6th grade is held from June 21 to Aug. 27.

The camp will be held at the Oak Grove site in La Cañada, next to La Cañada High School; La Cañada Elementary School; and the CEC site in Pasadena, near Caltech. At the Oak Grove site, a pre-K summer program is offered for children entering kindergarten in the fall.

Scheduled field trips include the Southern California Conservatory of Music, Discovery Science Center, Adventure Playground, IMAX Theater, Peterson Automotive Museum, ice skating, forest ranger guided hikes and more. Also featured are arts and crafts, drama, music, creative writing, swimming, outdoor sports and games, gardening, water play and science exploration.

Families may apply for the full summer or for weekly sessions; however, enrollment is limited at each location. For information, to obtain a brochure or to arrange a site visit, call the CEC at ext. 4-3418.

Radio clubs to have Field Day

The JPL and Caltech Amateur Radio clubs will hold their annual Field Day test of emergency communications skills over the weekend of June 26.

From the clubs' location atop Mount Gleason, they will use Morse code, voice and digital modes to contact as many stations as possible around the country. This yearly event tests amateur radio operator readiness to provide emergency support during earthquakes, floods or other emergencies.

Field Day operations begin at 11 a.m. on June 26. Visitors are invited to the site, a 45-minute drive from JPL via the Angeles Crest Highway. Non-radio amateurs can participate in making contacts or in such activities as using telescopes in the excellent viewing conditions of the hilltop location.

For more information, call JAY HOLLADAY at ext. 4-7758 or JIM LUX at 4-2075.

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meetings are available. Call the Employee Assistance Program at ext. 4-3680 for time and location.

Caregivers Support Group—Meets the first Thursday of the month at noon in Building 167-111 (the Wellness Place). For more information, call the Employee Assistance Program at ext. 4-3680.

Codependents Anonymous—Meeting at noon every Wednesday. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Group—Meets the first Friday and third Thursday of the month at noon in Building 111-117. Call the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parents Group for Children With Special Needs—Meets the second Thursday of the month at noon in Building 167-111 (the Wellness Place).

Working Parents Support Group—Meets the third Thursday of the month at noon in Building 167-111. For more information, call the Employee Assistance Program at ext. 4-3680.

Saturday, June 19

CEC Wine Tasting Benefit—The JPL/Caltech Child Educational Center will hold its annual fundraiser from 5:30 to 10 p.m. at Caltech's Avery House, 293 S. Holliston Ave. in Pasadena. The event will include fine wines, great food and live music from the Chad Edwards Quartet. Guests may bid on unique auction items and take their chances at the gaming tables. All proceeds will directly benefit the nonprofit organization, which has been providing high-quality child care and educational outreach services since 1979. General admission tickets are \$35; Connoisseur tickets include 10 tastes of premium wines, and are \$65. Tickets are available at the JPL Store, Caltech Book Store and the CEC, 140 Foothill Blvd. in La Cañada. Tickets may also be purchased at the door the evening of the event for an additional \$10. For more information, call ext. 4-3418.

Tuesday June 22

JPL Hiking Club—Photojournalist James Michael Dorsey will share his experiences with wildlife in 27 countries in a noon slide show in Building 238-543.

"Purchasing at JPL"—This two-day interactive course will be held in von Kármán Auditorium from 8:30 a.m. to 12:30 p.m. today and Wednesday. The end-to-end acquisition process will be covered, including key steps, what is not included in the acquisition process, key contact personnel for each step, time factors involved, required documentation and use of forms, rationale underlying requirements and ways to avoid potential challenges. Anyone who

purchases commodities or services using the services of the Acquisition Division should plan on attending. Register at <http://jplregistrar.jpl.nasa.gov/stc/persreg>. If you have questions, call Dana Edler (4-5825) or Aileen Batin (4-4281).

Wednesday, June 23

JPL Library Orientation—Come to Building 111-104 from 11:30 a.m. to noon for an overview of the Library's products and services, and learn how to access numerous electronic resources from your desktop. For more information, call the Library reference desk, ext. 4-4200.

JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Call Debbi Llata at ext. 4-8374 for information.

Thursday, June 24

Caltech Architectural Tour—The Caltech Women's Club offers this free service, which is open to the public. Meet at the Athenaeum front hall, 551 S. Hill Ave., Pasadena. Tour begins at 11 a.m. and lasts 1 1/2 hours. For reservations, call Susan Lee at (626) 395-6327.

JPL Golf Club—Meeting at noon in Building 306-302.

JPL Stories—Dr. Matt Golombek, planetary geologist in the Earth and Space Sciences Division, will present "Landing (and Roving) on the Red Planet," at 4 p.m. in the Library, Building 111-104. Golombek, project scientist for the Pathfinder mission, will discuss the challenges, responsibilities and joys of selecting landing sites on Mars. If you have questions about the JPL Story series or wish to participate, call Teresa Bailey at ext. 4-9233.



Wednesday, June 30

JPL Library Orientation—Come to Building 111-104 from 11:30 a.m. to noon for an overview of the Library's products and services, and learn how to access numerous electronic resources from your desktop. For more information, call the Library reference desk, ext. 4-4200.

Volunteer Professionals for Medical Advancement—Meeting at 10:30 a.m. at the Caltech Credit Union, 528 Foothill Blvd., La Cañada.

Thursday, July 1

Clogging Class—Meeting at noon in Building 300-217. For more information, call Shary DeVore at ext. 4-1024.

JPL Gun Club—Meeting at noon in Building 183-328.

Software process management approach is assessed

The Software Quality Improvement (SQI) Project at JPL recently participated in a formal assessment of the Lab's process management approach for software against the Capability Maturity Model Integration (CMMI). The CMMI was developed by the Software Engineering Institute as a model and guideline to help organizations improve the way they do business.

The CMMI model includes specific practices for four major categories: Process Management, Project Management, Engineering and Support. It is used to evaluate organizations against the specific goals and practices of each process area, as well as additional generic practices. A formal assessment using the CMMI model is called a SCAMPI, which stands for Standard CMMI Appraisal Method for Process Improvement. There are six capability levels in the Continuous Representation of the CMMI model: 0 – Incomplete, 1 – Performed, 2 – Managed, 3 – Defined, 4 – Quantitatively Managed, 5 – Optimizing.

According to Trisha Jansma, project element manager, SQI Deployment Element, JPL chose to be evaluated against three process areas that are part of the Process Management category, namely Organizational Process Focus, Organizational Process Definition and Organizational Training.

The purpose of the Organizational Process Focus process area is to ensure that an organization plans and implements its process improvement based on a thorough understanding of the current strengths and weaknesses of the organization's processes and process assets. The Organizational Process Definition process area's purpose is to ensure that an organization establishes and maintains a usable set of organizational process assets, usually called a Process Asset Library. Typical items in a PAL include standard processes, life-

cycle model descriptions, tailoring criteria and guidelines, measurement repository, checklists, templates, handbooks and the like. The purpose of the Organizational Training process area is to ensure that an organization develops the skills and knowledge of its people so they can perform their roles effectively and efficiently.

Jansma said these three process areas set the stage for process improvement activities since they help to document and share best practices, develop and organize various assets to support improvement, and share learning across the organization.

On March 26, when the SCAMPI outbriefing was held, JPL senior managers and the SQI Project were pleased to find that JPL had attained Capability Level 3 (Defined) for all three process areas that were part of the evaluation. "We have demonstrated that we have a solid foundation for moving forward with our software quality improvement activities," said David Nichols, JPL's software process owner and the manager of the Information Technologies and Software Systems Division (36). Ray Kile, lead appraiser from Center for Systems Management, said he was impressed with "the level of infrastructure that has been put in place to facilitate process improvement across the Lab, the quality of the JPL Software Training Plan, and the variety of courses on software management, software engineering and process improvement."

"While everyone was very happy with this achievement, all agreed that there is still much more work to be done in order to address the other process areas in the Project Management and Engineering categories," Jansma noted.

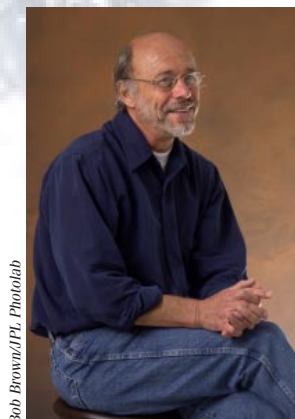
For more information about the SQI Project and this recent CMMI appraisal, visit the JPL Software website at <http://software.jpl.nasa.gov>.

AURA

P R E P A R E S F O R L A U N C H

By Rosemary Sullivan

Aura, NASA's latest Earth-observing satellite, is poised and scheduled to take flight from Vandenberg Air Force Base in July. The mission is designed to give us the best, most complete picture ever of the health of our atmosphere. Two of Aura's four instruments—the Microwave Limb Sounder (MLS) and the Tropospheric Emission Spectrometer (TES)—were designed, built and tested at JPL, and they will also be operated by the Lab.



Bob Brown/JPL Photolab

Taking a few moments in these last few days before launch, MLS principal investigator Joe Waters (above) and TES principal investigator Reinhard Beer (right) talk about the mission.



What are your instruments going to do and how do they fit into the Aura package?

Waters: The instruments on Aura are extremely complementary. Each has a job to do, but they work together to understand what is happening in the atmosphere. All four measure ozone, and three measure temperature, for example.

Each instrument also has unique measurements. MLS will uniquely measure bromine monoxide and chlorine monoxide, which destroy stratospheric ozone; hydrochloric acid, a safer form of chlorine; and hydroxyl radicals that are important to atmospheric chemistry but have never been adequately measured on a global scale before.

Major goals of MLS are to track the recovery of the stratospheric ozone layer and understand aspects of how atmospheric composition affects climate and vice versa.

Beer: One of Aura's major themes is to determine the processes controlling air quality, especially tropospheric ozone. TES is directly focused on tropospheric ozone.

One of the most important things TES will do is help us understand the intercontinental transport of pollutants. Every other day, we'll produce a global map of pollutants, such as tropospheric ozone, showing where they are and their altitude. Altitude matters because most transport takes place between two and eight kilometers above the surface. That's how pollution from Asia ends up in the United States, and Europe ends up with pollution from the United States.

Besides ozone, we'll be mapping carbon monoxide, methane and a couple of nitrogen oxides, which are an important part of the equation that creates tropospheric ozone.

What's the history of MLS and TES and how many people have been involved in building and operating them?

Waters: The concept for MLS was developed here at JPL starting in 1974, and I've been involved with it since then. First we flew an instrument on an aircraft. Then we had balloon experiments. Our first satellite MLS was on the Upper Atmosphere Research Satellite (UARS) launched in 1991.

We submitted the proposal for this new instrument—the one on Aura—in July 1988. The program had its ups and downs. At its peak, the equivalent of more than 100 full-time people were working on MLS.

There are 10 JPL members on the NASA "official" MLS science team, and three more from the University of Edinburgh in Scotland. During the MLS operations phase, there will be about 25 JPLers working on MLS operations, data and science. Production data processing for MLS and TES will be done by teams at Raytheon ITSS in Pasadena.

Beer: We'd been thinking about this for a while and submitted our proposal in July 1988. It was accepted in February 1989.

The program kept getting cut and re-scoped. Tom Glavich, our JPL project manager, deserves a special acknowledgement

for seeing this project through from the very beginning.

During the early years we put together the science team, and it now has about 20 people. About five years ago we started building the hardware. At our busiest, we had well over 100 people working on TES.

Most recently, we've been planning our ground data system. We have about 35 people here at JPL in the science computing facility, in Building 169. All the algorithm development and coding have been done here at JPL. Routine operations for TES will be done by Raytheon in Pasadena.

How is the new MLS on Aura different from its predecessor on UARS?

Waters: The new instrument is substantially advanced from the UARS instrument. This advance was made possible primarily with new technology developed by the JPL Sub-millimeter Wave Advanced Technology Group headed by Peter Siegel and new devices from our Microdevices Lab.

The new technology enables MLS on Aura to make measurements that were simply impossible with the previous MLS. These include hydroxyl, bromine monoxide, hydrochloric acid and others—all of which are important for tracking recovery of the ozone layer.

What special challenges did TES present?

Beer: The biggest challenge was to keep the program alive.

On a technical level, one of the biggest challenges involved one of the instrument's critical components, which is made from potassium bromide. Potassium bromide has some nasty properties. Leave it on your desk and when you come back you'll find a pool of water. It has to live in a vacuum. The spacecraft is in a tent flooded with dry nitrogen to make sure no water gets near it. The stuff is so soft that if you poke it with your finger it leaves a dent, yet we had to design a mount that can survive a launch environment.

Another challenge was that TES is a prolific data generator. When we first put it together five years ago, the state of computing was such that we were facing the possibility of being able to process only a fraction of the data. Now, with a cluster of top-of-the-line desktop computer chips, we now have enough computing power not only for our day-to-day operations but we can go back and reprocess everything whenever necessary.

What have you been doing these past few weeks before launch?

Waters: The last few months have been very busy, but very satisfying, as we approach launch for which we have waited more than a decade.

Our group has been making sure the software is in place for processing the data when they come in and making final pre-launch adjustments to the software.

Beer: Making sure launch software is in place—that we have everything ready for the first 90 days of the mission.

We've been conducting mission rehearsals, pretending we're getting real data and running it end-to-end through our system. Of course, the first time we did it, it didn't work exactly the way we wanted.

Are you nervous about launch?

Waters: Overall, I feel much more comfortable now than at launch of the previous MLS, which proved our technique works well in orbit. We've done a lot of testing and preparing with the instrument and the data processing and are prepared for launch. Both the instrument and software teams deserve tremendous credit.

Beer: Yes, of course, but I'm also excited.

Letters

My family and I were very touched and remain in appreciation for the many expressions of kindness and support in the recent passing of my father. He was a big fan of JPL and liked to brag to his friends about what we do here. He loved his yard and the things that grow there. So I know that he enjoyed your gift of flowers, which are now the newest lilies of his field.

David T. Spencer

On behalf of my family and myself, I would like to thank all my friends and co-workers at JPL for their kindness and thoughtfulness after the passing of my mother. Thank you as well for the beautiful plant and cards.

Cliff Fredericks

I would like to thank my friends and co-workers at JPL for their expressions of sympathy and support on the recent death of my grandmother. I would especially like to thank the IND and DSMS communities for their support during this emotional time. Your words of comfort, cards and prayers made this difficult time more bearable. I would also like to thank the Employee Services & Recognition Office for the lovely plant they sent to my home.

Wayne Sible

My heartfelt thanks to my co-workers for the beautiful flowers and words of encouragement regarding the passing of my father, Glenn Turpin. Also, thank you to JPL for the beautiful plant. Many of you knew my father and developed close relationships, after 21 years at JPL. He passed away on June 2 and had his ceremony with military honors on June 5.

Carl Turpin

Retirees

The following JPL employees retired in June:

Steven Cole, 25 years, Section 3512; Radheshya Das, 21 years, Section 346; William Taylor, 19 years, Section 366h; Joyce Pulliam, 16 years, Section 900; Frank Hartley, 14 years, Section 351; Edward Hagerott, 13 years, Section 387.

Classifieds

For Sale

BED, antique, brass and iron, exc. cond., made by Indiana Iron Foundry around 1885, recently repainted and brass repolished, headboard 58" H x 54"W, footboard 40"H, 73" long, would make a terrific child's bed, \$850, 352-4033, after 5.

BED, futon, queen size w/nice cover, used once, space problem forces sale, \$150/obo. 626/254-1550.

BICYCLE, Specialized Expedition "Comfort," 19," ridden less than 3 hours, pd. \$289, sell, \$150; HELMET, large, \$17; SHIPPING CASE for golf club, used once, \$50. 790-0697.

CLOTHES, infant: jacket, navy blue, zip-up w/hood, by Roitschild, size 3T, exc. cond., \$7/obo; jacket, red/navy blue, zip-up w/hood, by Old Navy, size 2T, exc. cond., \$5/obo; sweater, sky blue w/navy trim, buttons, size 3T, \$1/obo;) zipper shoes, Spongebob motif, size 11M, exc. cond., \$6/obo, photos of each item available. 626/791-6101.

COMPUTER DESK, on wheels, cherry veneer, made by O'Sullivan, model 61925, exc. cond., like new; best offer. 626/449-0997.

COMPUTER TABLE, like new, compact size, white, exc. cond., \$90/obo. 353-5872.

DIET TAPES, Jenny Craig, set of 14, \$25; COMPUTER POWER CONTROL CENTER, 5 power switches + 1 master switch, 5 surge-protected outlets + 2 modem/fax/phone jacks, new, \$20; CARD SHUFFLER, Johnson, collectible item, all-metal construction with carved-wood dowel handles, stands ~6" handle-high, and ~9" by 6", \$35. 790-3899.

DINETTE, glass top, 4 chair set, \$80; SECTIONAL SOFA, leather, beige color, \$400. 626/355-7086.

DODGER TICKETS, selected games from season ticket package, loge level (orange), aisle 132, inside first base, 2 tickets/game, face value (Yankees series not avail.), \$30 ea., see www.delunac.net/tickets. 626/296-1253.

DOORS, interior flush, gd. cond., shiny honey stained oak: four are: 79.5" H x 29" W, one is 79.5" x 24", all for \$40. 626/345-0681.

DVD PLAYER, Panasonic, single disc, black, refurbished, purchased new in 8/01 with transferable Best Buy 4-year service plan (expires 8/05), \$30. 626/222-1034, Jason.

FURNITURE: executive table, right-hand turn, \$80; sofa w/loveseat, light color, like new, \$80; conf. rm. chairs, 4, wooden, \$5/ea; folding tables \$5 each, sell for best offer. 626/841-8887.

FURNITURE, china hutch & 7-pc. din. room table/chairs, w/protective cover, \$1,000/obo; oriental rugs, India, handmade, Bishar design, wine background w/multi-color,

pictures in ERC, 4' x 6', \$250, 6' x 9', \$450/obo. 957-4746.

FURNITURE: 2-pc. Bassett sectional (1 pc. is a sleeper), floral print, photo & dimensions available, cushions need new covers, rest in gd. cond., \$350/obo. 626/791-6101.

GARDEN WAGON, used once, 48" L x 24 W, 12" fold-down side panels & pneumatic tires, >1,000 lb. capacity, \$40. 626/584-6518.

HITCH, Equal-i-ler sway control, complete system, the best sway control hitch available, exc. cond., \$160. 626/359-7666.

ICEBOX, antique, oak, exc. cond., made around 1915, 44" H x 32" W x 8" D, \$600. 352-4033, after 5.

JUICE FOUNTAIN, Breville, powerful stainless steel motor, great for daily juicing, bought 10/03, used 2-3 times only, orig. package, \$110/obo. 626/840-0955.

LAWNMOWER, Black & Decker, model MM850, 19", electric, 4hp, rear bag, 7 height positions, blades just sharpened, \$209 new at Home Depot, super lightweight, no fumes to breathe, hassle-free starting, needs no gas or oil, gd. cond., w/manual, \$110. 332-0481. LAWN MOWER, Eager, rear bag, \$50. 249-6629.

MISC: 8' pool table, \$500; table cloths, 2 slate blue oval, 18 matching napkins and rings, \$10; punch bowl set, 18 piece, \$10; mailbox, oversized, green, \$20; wig, red, shoulder length, never used, \$20, foodsaver with bags \$20; electric frying pan, \$10; answering machine, \$5; large oil painting, landscape, gold tones, paid \$175 in 1970s, sell \$75; fishing pole (saltwater), \$25. 626/357-8210.

MISC: dinosaur topiary forms (2), 4' tall, Hammacher Schlemmer, orig. price \$220/ea., sell for \$60/ea. or \$100/pair; theater tickets, 2, Little Shop of Horrors, Ahmanson Theatre, Aug. 26, 8 p.m., seats in mezzanine, orig. \$140 for pair, sell \$100. 790-8523.

MISC: diamond chip ring, ladies, 10K yellow gold, \$90; Wristop sports computer, Suunto S6, \$275; wireless intercom, Radio Shack, 3-station, \$40; water purification system, \$50. 897-1203.

MOVING SALE: couch, 8'; piano, baby grand; bedroom set, dressers, antique and classic chairs, beautiful; sofa/hideabed; china hutch & credenza; dining room set; end tables; double-wide refrigerator; antique stove; entertainment center; executive desk; file cabinets; computer desk; bookshelves; books; VCR; DVD player; Mac G3 computer; VHS tapes. 909/981-7492, Darlene or dhauge@yahoo.com.

MOVING SALE: sofa bed, \$50; loveseat, \$15; dining room set, antique, \$500; bed and frame, \$40; dresser, \$50; coffee table, \$30; side table, \$15; skis & boots, size 10M, \$75; chairs; small desk; coffee maker; ironing board; lamps; kitchen appliances; phones. 626/683-9224.

MOVING SALE: sofa bed, only 1 yr. old; coffee table; queen bed frame; dining table + chairs; floor lamp; bar stools; floor uplight; 28" Panasonic TV; microwave; coffee maker; + more. 626/795-3345 or backlund@sbcglobal.net.

ORGAN, Yamaha 415 electronic console w/13 pedals, 3 keyboards, 144 rhythm patterns, pd. \$7,500, sacrifice \$2,000; PORT REPLICATOR, for IBM Thinkpad, works with T20, T21, A20, A21, or X, R series, like new, \$85; ULTRA ATA CONTROLLER CARD with cable, fits into 32-bit PCI 2.1 or 2.2 expansion slot on motherboard, brand new, \$20. 790-3899.

PRINTER, all-in-one, Epson Stylus, RX500, print/scan/fax/copy, under full 3-yr. warranty at Fry's w/loaner on request, just bought new, great photo quality; must sell to make room for new laser printer won in raffle, \$225/obo. 323/578-8995, be@begrific.com.

SAXOPHONE, alto, Yamaha YAS-23 with soft case, gd. cond., \$450. 626/355-4447, John.

SCUBA GEAR: fins, snorkels, masks, computers, dry suits, wet suits, etc. 626/447-4734.

SURFBOARD, Spyder Jarvis, size 6 1/2', 1 yr. old, exc. cond., owner moving to Colorado for college, \$495/obo. 790-3109.

TILES, beautiful pre-sealed saltillo, terracotta clay, 300 square feet available, can be used indoor/outdoor, \$1.50 per tile/obo. 848-2214, David or Karen.

TREES (2), pine, large, healthy, and beautiful, 15' and 8', \$65 and \$45, or both for \$100. 249-4561.

VACATION COUNTRY CLUB MEMBERSHIP, based in So. Calif. w/exchange rights to 3,000 resorts nationally + internationally; your choice of 1 to 4 weeks/year of enjoying resort lifestyle at your choice of a huge variety of fantastic locations (great golfing incl. free); 2 bd., 2 ba. condo for up to 6 people; Club is selling memberships for \$19,900 but due to my spouse's recent death, anxious to sell, will accept \$4,000/obo. 805/967-7725

VIDEO GAME, Sony Playstation, w/memory card & 1 controller, \$30. 249-4561.

Vehicles / Accessories

'98 ACURA Integra, 2-dr., gd. cond., 5 spd., black, 72K mi., 100,000 mi. warranty, am/fm/CD player, \$9,700/obo. 626/705-1312 or sorozco@cfcu.org.

BEDLINER, over-the-rail style, for 2001 Dodge Ram Quad-Cab pickup with 6' 8" bed, factory Mopar liner with ram logo, vg cond., \$110. 332-0481.

'91 BMW 525i, 4-dr., gd. cond., automatic, burgundy, 172K mi., power moonroof, alarm w/keyless entry, am/fm/cassette, 6-disk CD changer, \$6,300/obo. 626/705-1312 or sorozco@cfcu.org.

'95 CHEVROLET Lumina, 6 cyl., 4 spd., auto, a/c, power steering/seats/breaks/door locks/windows, cc, stereo, am/fm, airbags, ABS, clean, \$2,750. 626/254-8704 or 818/795-5378.

'93 CHEVROLET Suburban 2500, 2x4, 350, V8, red, exc. cond., well maintained and low mileage, includes a/c, power doors & windows, wood trim dash, custom front seat sheepskin covers, running boards, new tires with Weld Wheels and Flowmaster Exhaust, \$8,500. 626/359-7666.

'94 DODGE Grand Caravan SE Sport, 3.3L V6, a/t, front & rear a/c, am/fm stereo with cassette, ~148K mi., integrated child seats, gd. cond. 626/914-9400.

'02 FORD Escape, V6, 4x4, silver, a/c, 2 airbags, alarm, alloy wheels, antilock brakes, bucket seats, CD changer, cruise

control, fog lights, tan leather interior, power locks/seats/steering/windows, prem. sound, rear defroster/wiper, remote keyless entry, sunroof/moonroof, tinted glass, low pkg., low mileage, \$15,300. 661/269-1362.

'01 HONDA 929RR, 4K mi., bought new in '03, \$6,600/obo. 661/251-1590.

'99 HONDA Civic LX, 4-dr., 5 speed, gray, 51K mi, orig. owner, am/fm/CD, pwr. window/doors/locks, a/c, alarm, driver/passenger side airbag, cloth interior, childproof rear window/locks, adj. steering wheel, cruise control; garaged, well maintained, exc. cond.: \$8,500. 909/466-8712, Charmaine or seamayes@netzero.com.

'93 HONDA Accord LX, 4-dr., 5 speed manual, 90K mi., one owner, great shape, \$4,000. 790-6989.

'91 JAYCO designer Cardinal 6 pop-up trailer, 3-burner stove, refrig., shower/toilet, overhead cabinets, stand-up closet, travel length 18' 10", campsite length 24' 2", sleeps approx. 5, \$4,000/obo. 909/590-1276.

KAYAKS (2), sea, used, "Sealution" by Wilderness Systems, with rudders, fore and aft hatches, bulkheads, 17' XL and 16' XS, rotomolded plastic, each includes like-new paddle & fitted sprayskirt, \$400/ea. 626/584-6518.

'01 MAZDA 626 LX, 46K mi., auto, silver, cruise control, dual front airbags, a/c, alloy wheels, CD, exc. cond., \$8,800/obo. 626/795-3345 or backlund@sbcglobal.net.

'96 PONTIAC Grand Am SE, V6, 3.1L engine, auto, power steering, air cond., cruise, elec. windows, ABS, stereo, runs very well, selling due to move, \$2,150. 626/683-9224.

PONTOON BOAT & pump, Bucks Bags Alpine, 6' inflatable, perfect for fishing small lakes, http://www.bucksbags.com, \$135. 626/794-4592.

TIRES (4), P285 60R16, \$100. 897-1203.

'94 TOYOTA Tercel, white, 4-dr., gd. cond., perfect for your new driver, teenager or high school grad, \$2,700. 957-8614 after 5 p.m.

'94 SATURN SC2, white, leather, a/c, automatic, ABS, alarm, 144K mi., cruise control, sat, radio, power locks/windows, gd. cond., \$2,200 or fair offer. 626/799-3276.

'99 VW Golf GL (new body style), 2 dr., 5-spd manual, red ext., dark cloth int., 58,300 mi., perfect cond. in/out, new tires/roof rack, see http://spider.ipac.caltech.edu/staff/rafael/golf, \$8,550. 323/644-5607.

'99 VOLKSWAGEN Passat, power everything, sunroof, heated leather seats, 2nd owner, www.begrific.com/4sale, \$13K/obo. 323/578-8995, be@begrific.com.

'02 VOLVO V4 wagon, only 12,300 mi., 4-cyl., 1.9L turbo, silver color, a/c, stereo/cassette/CD, dash cover, exc. cond., garage parked, all service records, price reduced, \$17,190. 626/355-5631.

'99 VOLVO V70 GLT, 2.4L turbo, very clean, white, loaded, family wagon, leather, heated seats, am/fm/CD/cass audio, moonroof, rear spoiler, roof rack, 3rd row seat, front/side airbags, full tinted glass, dual climate system, 17" white R-wheels, hot/cold box, new tires, recent fluids change, 90K mi., \$13,500/obo. 310/472-9283, Steve.

'83 VOLVO wagon, red, runs great, had much work done recently: new suspension, new electrical harness, transmission rebuilt; 175K mi., \$1,750. 626/345-9693.

Free

FILL DIRT, clean, 12 cu. yards avail., haul as little or as much as you like, near Los Robles/Jackson, Pasadena. 626/791-3103, drask6@its.caltech.edu.

Wanted

BOOKS, paperback or hardback, romance, science-fiction, mystery, etc. 248-0178, engineerbob4449@yahoo.com.

FITNESS STEP & RISERS for step aerobics, Reebok, approx. 43 x 16", 626/345-0681.

ROOM TO RENT, Pasadena or surrounding area, mature professional man just relocated from Maryland needs short-term (3-6 mo.) rental while locating permanent housing, willing to do minor home improvement projects as part of rent. 626/305-6338, day or 626/796-9291, rm. 316, Peter VanSickler.

SKYDIVERS, if you have jumped before or are interested, join the Caltech/JPL Skydiving club. Ext. 3-2655, thielman@yahoo.com.

SPACE INFORMATION/memorabilia from U.S. & other countries, past & present, for personal use. 790-8523, Marc Rayman.

VANPOOL RIDERS, from Victor Valley/Hesperia. Ext. 4-1424, Scott.

For Rent

ALTADENA, house to share in historic Janes Cottage Village, 1 mi. to JPL, 3 bd., 2 ba., completely remodeled, quiet, great neighborhood, large lot w/fruit trees, gardens, etc., dogs in backyard, private rm. + bath, female preferred, \$1,000, util. incl. 626/794-8884.

ARCADIA apt., 2 bd. + den, 1 ba., garage, remodeled, refrigerator/washer/dryer in unit, a/c, dishwasher; spacious, walking dist. to shops, exc. neighborhood, no pets, water/gardener/trash incl., \$1,300. 626/576-7333.

ARCADIA room to share, 5001 Ethan Ave., 1 bd., 1 ba., quiet, secluded residential area in cul-de-sac, home newly remodeled, \$650 + utilities. 626/221-9024.

BURBANK room in 2-bd. apt., walk to mall/shops, balcony, private bath, laundry in building, no pets, no smoking, \$595 + share util. 841-2830.

EAGLE ROCK historic Craftsman house, 2-story, furn. w/3 bd., 2 ba., fireplace, 2,100 sq. ft., large, tree-filled yard w/90-yr.-old Live Oak tree, rear brick patio, river rock front porch, 1-yr. lease starting 9/1, ideal commute to Pasadena/Glendale/SF Valley; approx. \$2,200, incl. water & gardener, negotiable if care for 2 cats. 323/344-7238.

LA CANADA, private room, single, non-smoker, female preferred, walking distance to JPL, available in Sept. 790-7920.

LA CANADA, private room in home, private bath, off-street parking, BBQ, pool, full kitchen priv., wash/dry, etc., avail. 6/15, \$550 + utilities. 790-1280.

MONTEREY HILLS condo, 2 bd., 1 ba., 3rd flr./private end unit, open and airy with nice

view, fireplace, hrdwood flrs. & carpet, central air/heat, dishwasher, stove, refrigerator, laundry rm. w/washer/dryer hookups, pool, secure ground-level parking, close to 110 fwy., 15 min. from JPL, \$1,200, cable, trash, gas and water included. 626/296-9073.

MONTROSE apt., 2 bd., 1 ba., a/c, garden, off-street parking, laundry, charming, view, trash/ water/gardener paid, 10 min./JPL, walking distance to Montrose Mall, \$1,250. 248-4637.

PASADENA condo, 2 bd., 2 ba., 1,300 sq. ft., wood floors, subterranean parking, on corner of Cordova and Mentor, avail. July 1, \$1,650, includes water. 626/827-5472.

PASADENA condo to share, quiet person, male preferred, near Caltech on Calif. Blvd., very clean, lg. rm. & bath, privacy, green trees, \$550 + \$35 util. 626/796-9221.

PASADENA, beautiful home in Hastings Ranch, 3 bd., den, 2 ba., central a/c, 2 fireplaces, refrigerator, stove, microwave, washer/dryer, large yard w/pool & spa, on golf course, lease required, avail. Aug. 1, \$3,300 + utilities & \$4,300 security deposit, 626/429-3677 or bettyrs@earthlink.net.

SAN MARINO house, 3 bd., 2 ba., 2-car garage w/automatic opener, newly painted, remodeled kitchen, dishwasher, a/c, laundry hookups, fireplace, spacious family rm. overlooking yard, no pets, exc. neighborhood and school district, \$3,200. 626/576-7333.

SIERRA MADRE, bachelor pad located on a quiet cul-de-sac, full bath and kitchenette (stove and fridge), use of pool, \$1,000 + security deposit. 626/796-6983.

Real Estate

ALPINE FOREST, 3.2 acre view lot, just 25 min. from Tehachapi; property sits among pine and oak trees at 6,300 ft.; 4 seasons are part of the enjoyment; buildable for a vacation retreat or secluded home site; property ass'n is responsible for road maintenance and security (gated w/guard); closest neighbor is 3/4 mile; \$40,000. 249-6071.

ALTADENA house, 1 mile from JPL, 2 bd., beautiful hardwood floors, wood burning fireplace, French doors, remodeled kitchen & bathroom, dishwasher, a/c, detached 2-car garage, gated backyard with patio, \$349,900. 626/791-7081.

COLORADO, 10+ level acres near Rio Grande/NM border, two adjacent 5-acre parcels on St. Hwy 248, will sell one or both for \$1K/acre/obo. 626/254-1550.

ESCONDIDO, golfers' paradise timeshare, Lawrence Welk Villa, fixed week #23, high RC / trading value, Wild Animal Park Zoo & Sea World close by, spacious 1,600 sq. ft., 2 bd., 2 full ba. with all amenities, cathedral vaulted ceiling and outside veranda overlook a beautiful 18-hole golf course, \$17,000. 249-6071.

GLENDALE, ranch-style house, upper Ross-moyne, newly remodeled, 4 bd., 2.5 ba., brand new family rm. & 2-car garage, kitchen has new granite countertops, GE Monogram stainless steel appliances, spacious master suite, formal dining rm, 2 fireplaces (liv. rm. + bdrm.), new deck overlooks park-like 13,490 sq. ft. lot, near end of cul-de-sac, 1444 Cordova, \$1.05M. 249-4536, Steve or Shelley.

Vacation Rentals

ARROWHEAD cabin, lakeview, 6 max., \$140/wkends., \$350/wk., others available, security/cleaning deposit required. 952-6221, Mon-Thur.: 909/337-1036, Fri-Sun. BALBOA ISLAND, cute 2 bd., 1 ba., apt., avail. weekly July-September, fully furnished, sleeps 5, covered deck, laundry, steps to bay and canal, \$1,200-\$1,500/week. 626/429-3677 or bettyrs@earthlink.net.

BIG BEAR LAKEFRONT luxury townhome, 2 decks, tennis, pool/spa, beautiful master bd. suite, slps. 6. 949/786-6548.

CAMBRIA house, ocean front, exceptional whitewater view, accom. up to 4 people, all amenities provided. 702/256-1359, ereynolds2@cox.net.

FLORIDA condo in New Smyrna Beach, fully furnished, 2 bd., 2 ba., full kitchen, half hour to Cape Canaveral, quiet, relaxing, over-looking beach, BBQ, pool, game room, great ocean view, easy walk to stores/restaurants, sleeps 6, avail. weekly or monthly. 909/981-7492, Darlene or dhauge@yahoo.com.

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps. 4, laundry fac., low season rate \$115/nite/2, high season rate \$130/ nite/2, \$15/nite/add'l person. 949/348-8047 or jackandrandy@cox.net.

LAKE TAHOE north shore timeshare, Sept. 5-12 (Labor Day week), 2 bd. and sleeping loft, tennis, racquetball, pool, Jacuzzi, sauna, \$500/week. petjal6@cs.com. 323/662-4089.

MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, slps. 6-8, fully equip'd kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/view to mtns., Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL disc'nt. 626/798-9222 or 626/794-0455 or valeriee@caltech.edu.

OCEANSIDE condo, on the sand, charming, 1 bd., panoramic view, walk to pier or harbor, pool/spa, game room, slps. 4. 949/786-6548.

RESORTS, 5-star, includes Carmel, Tahoe, Sedona, Colorado Rockies, Florida, Puerto Rico; lux. residential-style studios w/furn. kitchenette, starting at \$480 for 7 nts.; Puer-ta Vallarta special: studio w/full kitchen, \$399 for 7 nts., partial weeks also avail. 626/794-9579 or fivevstarresorts@earthlink.net.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/704-3906.

SAN FRANCISCO, Nob Hill Inn, walking dist. to Union Square, cable cars, Grace cathedral, financial district and Chinatown; non-smoking property. 15 miles from SFO, unit sleeps 4, one week from 7/30 to 8/04 (Lin-x Un World Conference week); \$600. tctfs@aprefix.com.

TIMESHARE at worldwide locations (see directory at www.IntervalWorld.com); 2 bd., 2 ba. accommodate up to 6 adults; 4- or 5-star resorts; need 2-mo. advance planning; \$950/wk. plus \$39 fee. 323/257-5703 or Edw_Ng@yahoo.com.

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Universe is published every other Friday by the Office of Communications and Education of the Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109.

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